

AMENDMENT

Serial Number: 09/761,355

Filing Date: January 16, 2001

Title: HIGH PRESSURE ANNEALS OF INTEGRATED CIRCUIT STRUCTURES

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Docket No: 303.275US2

IN THE CLAIMS**RECEIVED**

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1-78. (Canceled)

79. (Currently Amended) A method for forming an interconnect in a contact hole defined by walls of an insulating material and a supporting substrate, comprising ~~the steps of~~:

depositing titanium on the supporting substrate at the bottom of the contact hole;

depositing a titanium nitride layer on the walls of the contact hole and the supporting substrate;

annealing the supporting substrate to form titanium silicide between the supporting substrate and the titanium nitride layer;

filling the contact hole with a conductive material deposited on the titanium nitride layer by a CVD process, utilizing a pressure of at least approximately 1.1 atmospheres; and

forming a metal line on the conductive material over the contact hole.

80. (Previously Presented) The method of claim 79, wherein the contact hole has an aspect ratio of at least 2:1.

81. (Currently Amended) A method for forming an interconnect in a contact hole defined by walls of an insulating material and a supporting substrate, comprising ~~the steps of~~:

depositing titanium on the supporting substrate;

annealing the supporting substrate;

filling the contact hole with a conductive material by a CVD process, utilizing a pressure of at least approximately 1.1 atmospheres the depth of the contact hole being at least twice the diameter of the contact hole ; and

forming a metal line on the conductive material over the contact hole.

82. (Previously Presented) The method of claim 81, wherein the contact hole has an aspect ratio of at least 2:1.

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83. (Previously Presented) The method of claim 81, wherein the annealing step comprises annealing in a processing chamber having an inert gas ambient.

84. (Previously Presented) The method of claim 81, wherein the annealing step comprises annealing in a processing chamber having a nitrogen-containing ambient.

85. (Previously Presented) The method of claim 81, wherein the conductive material comprises aluminum.

86. (Previously Presented) The method of claim 81, wherein the conductive material comprises tungsten.

87. (Currently Amended) A method for forming an interconnect on the bottom of a contact hole in a supporting substrate comprising silicon, comprising ~~the steps of:~~

depositing titanium on the bottom of the contact hole in the supporting substrate to a thickness of approximately 500 to 2000 angstroms; and

annealing the supporting substrate in a processing chamber at a pressure of at least approximately 1.1 atmospheres and a temperature of less than approximately 700 degrees Celsius to form titanium silicide directly on the supporting substrate; and

filling the contact hole with a conductive material deposited ~~on the titanium nitride layer~~ by a CVD process, utilizing a pressure of at least approximately 1.1 atmospheres.

88. (Previously Presented) The method of claim 87, wherein the processing chamber contains an inert gas ambient.

89. (Previously Presented) The method of claim 87, wherein the processing chamber contains a nitrogen-containing ambient.

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90. (Currently Amended) A method for forming an interconnect in a contact hole defined by walls of an insulating material and a supporting substrate, comprising the steps of:

depositing titanium on the supporting substrate at the bottom of a contact hole;

depositing a titanium nitride layer on the walls of the contact hole and the supporting substrate;

annealing the supporting substrate to form titanium silicide between the supporting substrate and the titanium nitride layer;

forming a tungsten plug in the contact hole directly on the titanium nitride layer by a CVD process at a pressure of at least approximately 1.1 atmospheres; and

forming a metal line on the tungsten plug over the contact hole.

91. (Previously Presented) The method of claim 90, wherein the contact hole has an aspect ratio of at least 2:1.

92. (Previously Presented) The method of claim 90, wherein the titanium is deposited to a thickness of approximately 500 to 2,000 angstroms.

93. (Previously Presented) The method of claim 90, wherein the titanium nitride is deposited to a thickness of approximately 30 to 300 angstroms.

94. (Previously Presented) The method of claim 90, wherein the processing chamber contains an inert gas ambient.

95. (Previously Presented) The method of claim 90, wherein the annealing step is performed at a temperature of less than approximately 700 degrees Celsius.

96. (Previously Presented) The method of claim 90, wherein the tungsten plug is formed by depositing tungsten and force-filling the deposited tungsten into the contact hole at a pressure of at least approximately 1.1 atmospheres.

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97. (Previously Presented) The method of claim 90, wherein the tungsten plug is formed by depositing tungsten using chemical vapor deposition at a pressure of at least approximately 1.1 atmospheres.

98. (Previously Presented) The method of claim 90, wherein the metal line comprises aluminum.

99. (Previously Presented) The method of claim 90, wherein the metal line has a thickness of approximately 2,000 to 5,000 angstroms.

100. (New) A method for forming an interconnect in a contact hole defined by walls of an insulating material and a supporting substrate, comprising:

depositing titanium on the supporting substrate at the bottom of the contact hole;

depositing a titanium nitride layer on the walls of the contact hole and over the titanium at the bottom of the contact hole;

annealing the supporting substrate to form titanium silicide between the supporting substrate and the titanium nitride layer;

filling the contact hole with a conductive material deposited on the titanium nitride layer by a CVD process, utilizing a pressure of at least approximately 1.1 atmospheres; and

forming a metal line of a conductive material over the contact hole.

101. (New) The method of claim 100, wherein the inert gas ambient is argon.

102. (New) The method of claim 100, wherein the conductive material comprises aluminum.

103. (New) The method of claim 102, wherein filling the contact hole further comprises further annealing the conductive material at a temperature less than about 700 degrees Celsius.

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104. (New) A method for forming an interconnect in a contact hole defined by walls of an insulating material and a supporting substrate, comprising:

depositing titanium on the supporting substrate at the bottom of a contact hole;

depositing a titanium nitride layer on the walls of the contact hole and over the titanium at the bottom of the contact hole;

annealing the supporting substrate to form titanium silicide between the supporting substrate and the titanium nitride layer;

forming a conductive plug in the contact hole directly on the titanium nitride layer by a CVD process at a pressure of at least approximately 1.1 atmospheres; and

forming a metal line on the conductive plug over the contact hole.

105. (New) The method of claim 104, wherein depositing the titanium forms a deposit with a thickness of approximately 500 to 2,000 angstroms.

106. (New) The method of claim 104, wherein the depositing the titanium nitride forms a deposit with a thickness of approximately 30 to 300 angstroms.

107. (New) The method of claim 104, wherein the annealing is performed in an inert gas ambient.

108. (New) The method of claim 104, wherein the annealing is performed at a temperature of less than approximately 700 degrees Celsius.

109. (New) The method of claim 104, wherein forming the conductive plug comprises depositing tungsten into the contact hole.

110. (New) The method of claim 104, wherein forming the conductive plug comprises depositing aluminum into the contact hole.

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111. (New) The method of claim 104, wherein forming the metal line forms a metal line with a thickness of approximately 2,000 to 5,000 angstroms.

112. (New) A method for forming an interconnect in a structure formed on a substrate, comprising:

forming on a substrate an insulating layer having a contact hole therein with an aspect ratio of at least 2:1;

depositing titanium on the supporting substrate;

annealing the supporting substrate;

filling the contact hole with a conductive material by a CVD process, utilizing a pressure of at least approximately 1.1 atmospheres the depth of the contact hole being at least twice the diameter of the contact hole ; and

forming a metal line on the conductive material over the contact hole.

113. (New) The method of claim 112, wherein annealing the supporting substrate comprises further annealing in an inert gas ambient.

114. (New) The method of claim 113, wherein the further annealing comprises annealing in a nitrogen-containing ambient.